

CLAIMS:

1. A magnetic resonance imaging method for forming an image of an object, wherein
 - a stationary magnetic field (G_0) and temporary magnetic fields having a position dependent field pattern (G_1, G_2, G_3, \dots) are applied,
 - 5 - magnetic resonance signals are acquired by at least one receiver antenna,
 - spins are excited in a part of the object,
 - MR signals are acquired during application of the position-dependent field patterns patterns (G_1, G_2, \dots)
 - a magnetic resonance image is derived from the sampled magnetic resonance
 - 10 signals, whereas
 - the position dependent field patterns (G_1, G_2, \dots) are substantially non-linear,
 - the number N of total field patterns is larger than 3, and at least $N - 1$ field patterns are independently controllable in field strength.
- 15 2. A method as claimed in Claim 1, wherein the magnetic resonance signals are acquired in a sub-sampling fashion and the magnetic resonance image is derived from the sub-sampled magnetic resonance signals.
- 20 3. A method as claimed in Claim 2, wherein the magnetic resonance signals are sub-sampled by by means of an array of receiving antennae and the magnetic resonance image is derived from the sub-sampled magnetic resonance signals on the basis of the spatial sensitivity profiles of the array of receiving antennae.
- 25 4. A method as claimed in Claim 2, characterized in that fold-over artefacts are distinguished by continuity constraints of the object to be imaged.
5. A method as claimed in Claim 2, characterized in that fold-over artefacts are distinguished and discarded by knowledge of the sparsity of the object to be imaged.

6. A magnetic resonance imaging apparatus for obtaining an MR image from a plurality of signals comprising:

- means (10, 12) for applying a stationary magnetic field and temporary, substantially non-linear magnetic fields having a position dependent field pattern,
- 5 - at least one receiving antenna (13, 15) for acquiring magnetic resonance signals, during application of position-dependent field patterns (G_1, G_2, \dots),
- means (13) for excitation of spins in a part of the object,
- means (25) for deriving a magnetic resonance image from the sampled magnetic resonance signals,

10 wherein the magnetic field means are arranged to obtain substantially non-linear magnetic fields, whereas the number N of total field patterns is larger than 3, and at least $N - 1$ field patterns are independently controllable in field strength.

7. An apparatus as claimed in Claim 6, wherein means are provided for acquiring
15 the magnetic resonance signals in a sub-sampling fashion and means for deriving the magnetic resonance image from the sub-sampled magnetic resonance signals.

8. An apparatus as claimed in Claim 7, wherein an array of receiver antennae and means for determining the sensitivity profiles of the receiver antennae are provided.

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9. A computer program product stored on a computer usable medium for forming an image by means of the magnetic resonance method, comprising a computer readable program means for causing the computer to control the execution of:

- applying a stationary magnetic field and temporary magnetic fields having a
25 position dependent field pattern, whereas the magnetic fields are substantially non-linear and the number N of total field patterns is larger than 3,
- acquiring magnetic resonance signals by at least one receiver antenna,
- exciting spins in a part of the object,
- acquiring MR signals during application of position-dependent field patterns
30 (G_1, G_2, \dots),
- deriving a magnetic resonance image is from the sampled magnetic resonance signals,

controlling at least $N - 1$ field patterns independently in their field strength.

10. A computer program product as claimed in Claim 9, additionally acquiring the magnetic resonance signals in a sub-sampling fashion and deriving the magnetic resonance image from the sub-sampled magnetic resonance signals.